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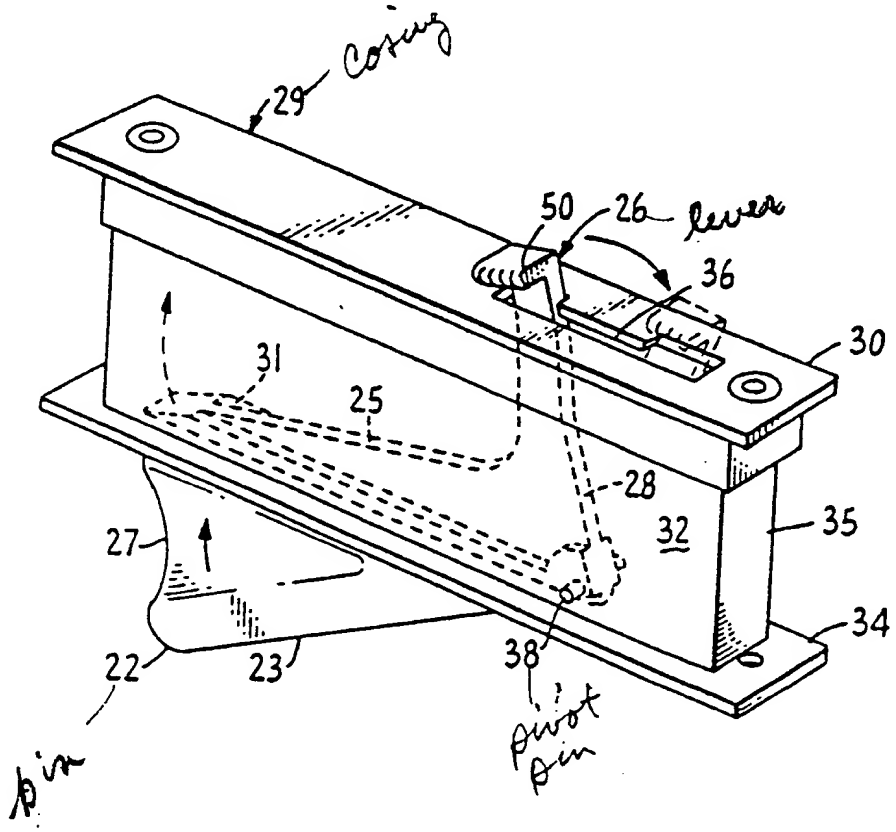
(54) Title: RETRACTABLE WATER BOARD FIN

(57) Abstract

A generally trapezoidal fin (22) is pivotally fastened to a casing which can receive the entire fin, permitting total retraction of the fin. The casing is formed with at least one notch (42) for selectively positioning the fin relative to the casing. In a preferred embodiment, the fin is operated by a lever member (26) which has a knob (50) at its distal end for use in positioning the fin (22) from above.



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RETRACTABLE WATER BOARD FIN

Background and Summary of the Invention

This application is a continuation-in-part of applicant's prior filed application entitled RETRACTABLE WATER BOARD FIN, Serial No. 820,104, filed January 21, 1986.

The present invention relates generally to water boards, and more specifically to a retractable fin which imparts stability to the water board in use and which retracts without interfering with the user.

Water boards are similar to water skis. The water boarder is towed behind a powerful boat. The main difference, however, is that the water boarder kneels on his/her board. A strap is provided on the water board for the "boarder" to place his/her thighs to keep the board in contact with the knees and shins of the boarder. It has been recognized that the stability of the water board can be greatly improved, under certain conditions, by the addition of two fins on the underside of the board which provide control and lateral stability at high speeds. While this increase in stability is desirable for certain types of water boarding, there are other styles of water boarding wherein the fins are neither necessary nor desirable. One example of such a style would be jumping where the board and the boarder are towed across an inclined plane to gain altitude. Others would be spin-360s and side slides. The present invention provides a retractable feature for the fins.

The use of fins or skegs to impart stability is a technique known in water skiing, surfing and sailing, wherein the fin is called a keel. There are several patents which are typical of the design of water ski fins. U.S. Patent No. 3,087,173 shows an adjustable, retractable fin positioned at the aft end of the ski. The fin is contained within a raised housing which protrudes above the plane of the ski surface. The position of the fin is controlled by two leaf springs and an S-shaped track through which a slide pin travels. U.S. Patent No. 3,066,327 discloses a retractable stabilizer for water skis which pivots about a pin

passing through the stabilizer and its housing disposed at the aft end of the ski and above the ski surface. Latch means are provided to maintain the stabilizer in the retracted position. U.S. Patent No. 3,082,444 describes a water ski safety skeg which is protected from damage from underwater debris and inclined ramps by its ability to automatically retract.

While the water board fin is subject to the same design criteria concerning underwater debris and ramps, etc., the water board presents a problem not present in water ski skeg design. This difference relates to the quality and quantity of user contact with the board. A water skier's contact with the water ski comprises the placement of his/her foot in a rubber binding. The remainder of the water skier's body is not intended to contact the ski. Thus, the stabilizers used on water skis are permitted to protrude above the surface of the ski without interfering with the skier. Water boards on the other hand must carefully guard against this above surface protrusion since the water boarder's knees and shins are in contact with the board surface all the way to its rear terminus. The location of the skegs at the aft end of the water board or ski results from the dynamics of the stabilizing phenomenon. This location is not subject to a large degree of variation due to the dynamics of the board in motion. This invention provides a retractable fin which protrudes only minimally above the water board surface.

Therefore, it is an object of this invention to provide a retractable fin for a water board which does not interfere with the boarder's knees or shins.

It is a further object of this invention to provide a retractable fin which can be selected to be in the retracted position or in the extended position.

In a retractable fin, the improvement comprising an elongate lever member attached to the fin, a notched casing and pivot means to fasten the fin to the casing. The retractable fin is attached to the casing such that the fin does not protrude above the casing and is completely maintained within the casing. In a preferred embodiment, the lever member has beveled locking

means disposed along its longitudinal axis for cooperation with the notched casing and a handle at its distal end for selectively positioning the fin relative to the casing.

Brief Description of the Drawings

Fig. 1 is a perspective view of a water boarder and a water board showing the retractable fins of the present invention;

Fig. 2 is a perspective view of the retractable water board fin of the present invention;

Fig. 3 is an exploded, perspective view, with parts broken away, illustrating the lever member and casing notches of the retractable fin;

Fig. 4 is a cross-sectional view of the retractable fin, shown in side elevation;

Fig. 5 is a sectional view taken along the line 5-5 in Fig. 4;

Fig. 6 is a sectional view taken along the line 6-6 in Fig. 4;

Fig. 7 is a sectional view taken along the line 7-7 in Fig. 4;

Fig. 8 is a sectional view taken along the line 8-8 in Fig. 4;

Fig. 9 is a sectional view of a second embodiment of a retractable fin assembly according to the present invention;

Fig. 9A is a perspective view, with portions broken away, of a third embodiment of a retractable fin assembly according to the present invention;

Fig. 10 is a side elevational view of the third embodiment, with portions of a water board being shown in cross section;

Fig. 11 is a bottom view of the fin assembly of the third embodiment;

Fig. 12 is a sectional view taken along the line 12-12 in Fig. 10;

Fig. 13 is a sectional view taken along the line 13-13 in Fig. 10;

Fig. 14 is a sectional view taken along the line 14-14 in Fig. 10;

Fig. 15 is a sectional view of a fourth embodiment of a fin assembly according to the present invention;

Fig. 16 is an enlarged view of a portion of the embodiment shown in Fig. 15 with portions broken away;

Fig. 17 is a view looking toward the bottom of a water board, showing a fifth embodiment of a retractable fin assembly according to the present invention;

Fig. 18 is a perspective view of portions of the mounting mechanism of the fin assembly shown in Fig. 17;

Fig. 19 is a cross-sectional view of the fin assembly of Fig. 17, shown in side elevation;

Fig. 20 is a cross-sectional view of a sixth embodiment of a fin assembly in accordance with the present invention;

Fig. 21 is a cross-sectional view of a seventh embodiment of a fin assembly in accordance with the present invention;

Fig. 22 is an exploded, perspective view of the fin assembly shown in Fig. 21;

Fig. 23 is an enlarged, exploded view of components of the slide mechanism of the fin assembly shown in Fig. 21; and

Fig. 24 is a sectional view taken along the line 24-24 in Fig. 21.

Detailed Description of the Preferred Embodiments

While the retractable fin of the present invention is described with reference to a HYDROSLIDE kneeboard (Kransco Manufacturing, Inc., San Francisco, California), it is intended that the retractable fin can be utilized in conjunction with BOOGIE Boards (Kransco Manufacturing, Inc., San Francisco, California), wherein the user lies upon the board surface, and in conjunction with surfboards, too.

A water board 10 is shown in Fig. 1. A strap 12, fastened at either end of board 10, encircles the mid-thighs of a boarder 14. Board 10 and boarder 14 are propelled through the water by holding onto a tow rope 16 which is attached at its other

end to a power boat (not shown in this figure). Boarder 14 kneels upon the upper surface of board 10 such that his knees 18 and shins 20 are in contact with the upper surface. On the underside of board 10, identical fins 22 constructed according to the invention are shown in their extended position near the aft end of board 10. A lever 26 is shown extending above board 10 upper surface approximately at the boarder's ankles. This location permits boarder 14 to adjust the position of fins 22 while underway.

A more detailed view of the retractable fin mechanism can be seen in Figs. 2 and 4. As there shown, lever 26 is part of retractable fin 22. The body of fin 22 is generally planar and trapezoidal in shape, having two generally horizontal edges 23 and 25, and two parallel, generally vertical edges 27 and 28, and an intermediate stop collar 31. It is intended to be within the scope of this invention for lever 26 and fin 22 to be two separate pieces fastened substantially in the manner as shown in the appended drawings in any of several fastening methods known to those skilled in the art.

Fin 22 is received in a casing 29 formed by a slotted top 30, side walls 32 and 33, a slotted bottom 34 and end walls 35. A slot 36 is provided in top 30 to receive lever 26. The side and end walls of the casing define a cavity. Fin 22 is pivotally fastened within cavity 29 by pivot pin 38 which passes through a lower corner of fin 22, and openings in walls 32 and 33. Movement of lever 26 in slot 36 forces fin 22 to rotate about pivot pin 38, causing fin 22 to move between the retracted and extended positions relative to casing 29. In the extended condition, as shown in solid lines in Fig. 4, collar 31 abuts against bottom 34 to either side of the slot, designated 37, formed therein. Fin 22 is designed such that its bottom edge 23 coincides with the plane of bottom 34 when fin 22 is totally retracted. This retracted position permits board 10 to be towed across an inclined ramp without damage to fin 22 or casing 29. The totally retracted fin position is also desirable for several of the stunts described above (e.g., spin-360s and side slides).

Fin 22 and casing 29 are so proportioned that when

retracted the fin is completely contained within the casing. (See the phantom line representation of Fig. 4.) The only member which extends above the plane of upper section 30 is lever 26. The cooperation of lever 26 and slot 36 must be sensitive to two different applications of force. First, lever 26 can be manually activated by boarder 14 who wishes to extend or to retract fin 22. This adjustment must be relatively easy for boarder 14 to accomplish while board 10 is in use. Secondly, lever 26 must move easily in slot 36 when fin 22 is struck from below the water Line by a submerged obstacle or ramp. Thus, lever 26 must be able to easily translate forces from above and below pivot pin 38 without failure which could easily lead to complete destruction of fin 22 or fracture of lever 26.

In the exploded view of Fig. 3, top 30 is shown removed from walls 32, 33 and 35. Lever 26 is shown in the fin extended position and received within a notch 42 in wall 30. A fin retracted notch 44 is formed in wall 30 approximately 30 degrees from notch 42, as measured about the axis of pivot pin 38. This embodiment has two positions, extended or retracted, but it is intended to be within the scope of this invention to have any number of available positions permitting intermediate levels of fin extension. Top 30 has two positions in slot 36 which correspond to notches 42 and 44 in rear casing wall 33. Lever 26 is formed with detent protrusions 46 which is complementarily engageable with notches 42 and 44. The protrusion has beveled edges 48. A knob or handle 50 is formed on the distal end of the lever. When lever 26 is contained within casing 29, protrusion 46 is selectively received within notches 42 and 44. Beveled edges 48 of protrusion 46 make it easier for protrusion 46 to slide and to be displaced from notches 42 and 44. Therefore, if fin 22 is disposed in an extended position (corresponding to notch 42), and it strikes an obstruction, beveled edges 48 facilitate cam-like displacement of protrusion 46 from notch 42 and permit fin 22 to be retracted. Lever 26 also has a bend 47 along its longitudinal axis which causes it to act as a leaf spring. At rest, leaf-spring-lever 26 rests against rear casing wall 33 and its corresponding notches

42 and 44. When force is applied either from below, as when fin 22 strikes an obstruction or the like, or from above, as when boarder 14 desires to select a position by manually applying force to the distal end of lever 26 through knob 50, beveled edges 48 facilitate the movement of lever 26 out of the notched positions and along the plane of casing wall 33. The thickness of protrusion 46 serves to offset lever 26 away from rear casing wall 33 thereby clearing the set positions in slot 36.

The cross-sectional view of Fig. 4 illustrates the various positions of fin 22 relative to casing 29 and the geometric relationship between fin 22 and casing 29. Casing 29 is set in water board 10 such that its height is coincident with the thickness of board 10. Lever 26, with knob 50, is shown in notch 42. In this position, fin 22 is extended, with collar 31 abuttingly engaged with bottom 34. The retracted fin position, corresponding to notch 44 is shown in phantom lines. In the later position, lower horizontal fin edge 23 corresponds with the plane of bottom 34. A flattened corner 51 on fin 22 permits it to fit fully within casing 29.

Top 30 is removable from side walls 32 and 33 and end walls 35 to enable the casing to be inserted into place in a slot therefor within a board. As viewed in plan, top 30 and bottom 34 have transverse dimensions greater than that of the box defined by the side and end walls of the casing. This greater dimension provides flange surfaces which engage with the outside surfaces of a board within which the casing is received. The casing is held in place within a board by screws 54 which seat against bottom 34 and extend through openings 56 therein into threaded engagement with nuts 58 received in openings 60 in top 30. It will be appreciated that the casing has a depth equal to or less than that of the board so that when secured in place within a board, the casing does not significantly protrude therefrom.

It can also be seen in Fig. 4 that fin vertical edge 25 is slightly curved in this embodiment. This curvature contributes to the favorable dynamic properties of fin 22 and is generally unrelated to its retractable features.

Referring now to the sectional view of Fig. 5, the leaf-spring effect of bend 47 can be more clearly seen. Lever 26 is contained within casing 29 defined by the side and end walls of the casing. Near bottom 34, pivot pin 38 is shown passing through fin 22, and casing walls 32 and 43. Bend 47 causes lever 26 to be flush against casing wall 30. Lever 26 is made of sufficiently pliable material such that it can be made to flex as shown by the phantom lines. This pliability makes it possible for lever 26 to be easily moved. Polycarbonate material, such as Dow CALIBRE 330-10, or G.E. LEXAN 141, has been found suitable for fabrication of the casing and fin body components, including lever 26.

Fig. 6 shows the top of lever 26 within slot 36 formed in top 30. Slot 36 defines the arc through which fin 22 is permitted to rotate about pivot pin 38. It is important that lever 26 be restricted to a certain arc of movement. Fin 22 has a maximum extended position, corresponding to the placement of lever 26 in Fig. 6, and a maximum retracted position which corresponds to the outer position represented by the dashed lines. An enlarged locking boss 60 is formed integrally with top 30 and extends into slot 36 to assist in releasably securing the lever at the positions of maximum retraction and extension of the fin.

Fig. 7 shows how, despite the well-defined positions represented by slot 36, lever 26 can be moved by the application of force to the bottom of the fin, without the application of force at the top end of lever 26. The section of Fig. 7 is taken below the plane of top 30 and illustrates notches 42 and 44 and locking member 46. As there seen, the beveled edges of protrusion 46 permit lever 26 to be easily moved out of notch 42. Fig. 7 shows how the top of lever 26 is set back from locking protrusion 46. This offset, of a distance equivalent to the thickness of locking member 46, allows the top of lever 26 to be lifted out of slot 36 position corresponding to notch 42 when a retracting force is applied from below to fin 22.

A second embodiment of a fin assembly according to the present invention is shown in Fig. 9. A casing, indicated at 62, is shown in cross section and includes a bottom 64 provided with

apertures for receiving threaded means for affixing to a water board. A fin, of generally triangular configuration, is indicated at 66 and is pivotally connected to casing 62 at 68. A torsion spring is provided around pin 68 so that one of its arms 78 is urged against a front wall of casing 62 while the other arm 70b exerts a downward force against top surface 66a of fin 66. Arm 70b normally biases fin 66 to an extended position as shown in Fig. 9.

When it is desired to retract the fin, one presses against the bottom surface thereof so as to push fin 66 upwardly so that rear surface 66b of fin 66 slides against a release lever generally indicated at 72. The release lever includes a resilient or flexible arm 74 with an extension at the bottom portion thereof indicated at 76. The bottom of 76 may be provided with a suitable roughened surface for enabling purchase by one's finger, in the manner to be hereinafter described. In any case, with fin 66 moved upwardly into the position shown in phantom line in Fig. 9, extension 76, which initially was moved by edge 66b of fin 66 as it was retracted, now is seated beneath a notch 66c formed in fin 66 thereby to maintain the fin in a retracted position. The release lever, in effect, is a combination retaining/release means operable for cooperating with notch means 66c to maintain the fin in a retracted position, and is also pivotally movable, to permit the fin to be extended. For example, when it is desired to extend the fin, one may press against an upper, inclined surface 66d of fin 66 with sufficient force so that arm 74 is pivoted clockwise, when viewing Fig. 9, thereby to release notch 66c from engagement with extension 76. Upon release of that engagement, the torsion spring urges fin 66 downwardly until a bottom surface of a ridge 67 of the fin engages the bottom of fin casing 62.

It will also be noted that one may engage extension 76, when the fin is in a retracted position, to move the extension to the left, thereby to permit torsion spring 70 to urge the fin into its extended position. In addition, fin 66 may be dimensioned so that upper surface 66d is disposed above the top wall of the fin casing, thereby to present a surface so that one may initially

engage the fin, when it is in its retracted position, to push the fin downwardly so that the release lever will be moved rearwardly to cause disengagement.

As shown in Fig. 9A, a third embodiment of the present invention includes a fin assembly generally indicated at 78, which includes a fin casing 80 and a removable fin 81. The concept behind fin assembly 78 is to provide a fin which may be maintained in a retracted position wholly within the casing, and when it is desirable to extend the fin, it is pivoted downwardly, and then rotated about the fin's longitudinal axis, for repositioning within fin casing 80 so that fin 81 extends downwardly. Essentially, the fin is "flipped over" between its extended and retracted positions, and a ball and socket construction is utilized to achieve this result. The specifics of the casing and fin construction will now be described.

Fin casing 80 includes an upper box-like section having a front wall 82, side walls 84, 86 and a bottom plate 88. Mounted in a position which would correspond to the back wall is a release lever 90 which includes an extension 92 operable for engaging fin 81 in a manner to be described. The perspective view shown in Fig. 9A is partially cut away to expose various features. First, it will be noted that on the inside of side wall 86 there is provided an elongate rail or stop element 94. Similarly, on the inside of wall 84 there is another rail or stop element, such as shown at 95 in Fig. 14.

As shown in Fig. 9A, front wall 82 is provided with a circular, access means such as an aperture 96 which extends into a slot 98 provided in bottom plate 88. Slot 98 further extends into a "socket" such as a circular, beveled aperture 100 provided in bottom plate 88. Apertures 96, 100 are dimensioned for receiving a ball means or sphere 102 which is mounted at the end of a projection or rod 104 which is secured, in turn, to a rectangular bar 106 mounted on top of fin 81. It will also be noted that the rear of bar 106 is provided with a locking/catch means such as a tab or extension 108.

With attention now also directed to Fig. 10, use and

operation of the third embodiment which has been shown with respect to Fig. 9A will be further described. As shown in Fig. 10, fin 81 is in its extended position as shown in solid outline. Extension 108 is retained in position by release lever 90 and in particular by extension 92 engaging beneath extension 108 to hold fin 81 in position. Fin 81 is maintained further in position by rail 94 and a rail on the inside of wall 84 which is not shown. The rails engage the top surface of bar 106. As shown in Fig. 10, with fin 81 in its extended position, sphere 102 is seated within circular aperture 100 (the aperture is provided with a bevel) and rod 104 is situated within slot 98. If it is desired to position the fin into a retracted position, one places a finger against extension 92 and, viewing Fig 10, moves that extension to the left, thereby releasing tab 108 from engagement with release lever 90. The fin is then permitted to drop down vertically, while being held to bottom plate 88 by virtue of sphere 102 being seated within circular aperture 100. The fin can then be rotated 108 degrees, so that it faces upwardly, and moved to a final position such as shown by the dashed lines in Fig. 10, whereupon the opposite side of extension 108 engages release lever 90 so that it is secured in position.

While Fig. 10 shows a water board, such as indicated at 10, having a dimension somewhat thicker than the fin casing, it is contemplated that there may be an opening whereby one can push on the top of the fin, when it is in the retracted or reversed position as shown in Fig. 10, in order to push it out of engagement with release lever 90. Aperture 96, which is dimensioned with a diameter slightly greater than sphere 102, is provided for completely removing fin 81 if desired. To remove the fin, it is necessary to release extension 108 from engagement with release lever 90, and move the fin downwardly so that it is in a substantially vertical position, relative to fin casing 80, so that sphere 102 may be shifted through circular aperture 96. The fin can then be removed and another fin can be used. Thus, what has been described and disclosed is a fin which is readily removable from its fin casing, and one which is rotated 180 degrees from

the extended and retracted positions. No tools are needed for fin adjustments, and a great depth is not required for the fin casing. The fin assembly may be thought of broadly as one which includes means for enabling rotation of the fin about its longitudinal axis so that it may be selectively positioned in an extended or retracted position. The means for enabling rotation include the circular apertures 96, 100 and slot 98 which cooperate with rod 104 and sphere 102.

Turning now to Fig. 15, a fourth embodiment of a retractable fin is disclosed. As shown, a fin assembly 110 includes a fin casing 112 and a fin 114 which is pivotally connected by means of a pin 116 to the casing. Extendable/retractable means are indicated generally at 118, and include rotatable means 120 including a knob secured via a thread means 122 to a nut means 124 to effect raising and lowering of fin 114 from retracted to extended positions and vice versa. As shown in Fig. 16, which is an enlarged, perspective view of fin assembly 110 with portions cut away, nut means 124 is formed with a pair of upstanding walls 126, 128 which are secured to fin 114 by connection to an upper portion 114a thereof. Spanning between walls 126, 128 are nut elements 130, 132 which engage thread means 122 and in particular the spiral or helix portions of the thread means. Thus, when rotatable means or knob 120 is rotated, depending upon direction, fin 114 will be moved either upwardly or downwardly, or into an extended or retracted position, or any intermediate position so desired. It is contemplated that only two to three turns will effectuate movement from a fully retracted position to one which is fully extended such as shown in the phantom lines of Fig. 15. A simple rotatable system is provided, i.e., a fin assembly is utilized which includes rotatable means operable for directing movement against a fin thereby to selectively push or pull the fin so that it moves to a selected position.

Turning now to Figs. 17-19, a fifth embodiment of the present invention will now be disclosed. This embodiment is directed to a fin assembly which contemplates that the fin will be rotated from a vertical or extended position by 90 degrees to

a fully retracted position. As shown in Fig. 17, a fin assembly 134 is defined by a recess 136 provided in the bottom of a water board 10 with rotatable means enabling a fin 138 to be rotated along an axis generally parallel to the longitudinal axis of the board. The fin thereby can be rotated from a vertical position, as shown in Fig. 17, through an angle of 90 degrees to a "folded over" position fully retracted within recess 136, so as to provide a flat surface when the fin is so retracted. As can be seen, recess 136 is provided generally with the profile of fin 138, and may be formed as a separate fin casing or formed out of the bottom of the water board material itself.

The specific means for enabling selective rotatable positioning of fin 138 from a retracted to extended position is set forth in Fig. 18. As shown in that figure, and with reference also directed to Fig. 19, it can be seen that a pair of mounting means or end support elements 140, 142 are secured to the bottom of water board 10, and each includes pin means such as pins indicated at 144 and 146 extending therefrom. Pin 144 is mounted to support element 140 by means of an orienting means 146 configured with an orthogonal or square shape. Fin 138, which is broken away in Fig. 18 and greatly shortened along its length, is defined by an upper portion formed as a circular bar 148 which includes bores 150, 152 extending partially thereinto along the longitudinal axis from opposite ends thereof. The purpose of bores 150, 152 is to receive pins 144, 146, respectively. Further details include an orthogonal recess 154 provided on rod 148 adjacent bore 150 for receiving orienting means 146. Spring or biasing means 156 is concentrically disposed over pin 147, so that when the pin is inserted through bore 152, and with pin 144 inserted in bore 150, the fin is urged toward the left and held securely in position as shown in Fig. 19. Recess 154, because it is formed as a recess having right angles, is located on orienting means 146, so as to dispose it either in the extended or vertical position as shown in Fig. 19, or, upon suitable rotation of fin 138, is positionable so that the fin may seat within accommodating recess 136.

Explaining further, when it is desired to move fin 138

from its extended or vertical position such as shown in Fig. 19, one presses against back edge 138a of the fin, to the right of Fig. 19, so that biasing means 156 is compressed, thereby enabling fin 138 to be rectilinearly shifted to the right. When it is shifted far enough, recess 154 is freed from engagement with orienting means 146 and fin 138 may now be pivoted 90 degrees upwardly, while still being urged to the right in Fig. 19, until it is positionable upwardly against recess 136 (see Fig. 17 also). Pressure against biasing means 156 may now be released, and the fin now seats itself firmly into position within recess 136 because recess 154 is now oriented to receive orienting means 146, at a 90-degree different position from the extended position. Thus, what has been described is a fin assembly including fin means rotatable about its longitudinal axis through 90 degrees for preselecting positioning between fully extended and fully retracted positions.

The idea here is that the fin does not have to move along a vertical plane, between extension and retraction, but rather rotated so that it essentially lies on its side in the retracted position. A compact, low profile is assured during such stowage. When it is desired to shift the fin from a fully extended position to one of complete retraction, it is only necessary to simply push the fin forward, rotate it 90 degrees and then release the fin so that biasing means 156 locks the fin into retracted position. To return the fin to an extended position, it is shifted against biasing means 156 until recess 154 is freed from engagement with orienting means 146. The fin is then rotated 90 degrees to a vertical position and permitted to shift rearwardly for locking engagement between orienting means 146 and recess 154.

A still further embodiment of the present invention is illustrated in Fig. 20, which defines a sixth embodiment. This embodiment is directed to providing an elongate means connected to a fin operable for extending and retracting the fin. By "elongate" means, it is meant an elongate element, movable relative to the fin, so that a pushing or pulling force may be exerted along the longitudinal axis of the elongate element to push or pull the fin

into a selected extended or retracted position. As shown in Fig. 20, a fin assembly is generally indicated at 158, and includes a fin casing 160 and a fin 162 which is pivotally connected by means of a pin 163 or similar element to the casing. Connected to fin 162 is an elongate means 164 which is used to extend and retract fin 162. Elongate means 164 may be dimensioned for positioning at any location along a water board, i.e., at a position remote from a boarder. In other words, accessibility to elongate means 164 is determined only by its length. In the view shown in Fig. 20, a knob 166 is provided at the distal end of elongate means 164 to facilitate gripping by a boarder. Additionally, a guide 168 with a recess 170 is provided for receiving a pin 172 from elongate means 164. Moreover, a spring washer may be mounted adjacent pin 163 to increase friction to help hold the fin in position. If desired, friction means such as "chatter teeth" indicated at 174 may be provided on an inclined surface 176 of fin casing 160. Thus, what has been described, in broadest terms, is a fin assembly comprising actuation means defined by elongate means flexibly connected to a fin operable for extending or retracting the fin upon pushing or pulling the elongate means.

The last or seventh embodiment of the present invention is set forth in Figs. 21-24. As shown in Fig. 21, which is a cross-sectional view through the fin casing, a fin assembly is generally indicated at 178 for receiving a fin 180 therewithin. Fin 180 is similar to fin 22 shown in Fig. 1, i.e., a lever is provided at 182, but here extends to a position adjacent the top of fin assembly 178 so that it engages an actuating means defined by a slide element 184 configured for being shifted or pushed by one's fingers, in a rectilinear direction either rearwardly or forwardly to effect extension and retraction of the fin, or positioning in an intermediate orientation if desired. With reference to Fig. 22, it can be seen that fin assembly 178 includes an upper assembly 186, formed as a box-like construction, which fits over a bottom assembly 188. A slot 190 is provided in upper assembly 166 for receiving an upper portion of lever 182. Additionally, slide element 184 is provided with downwardly

depending legs 190 (see Figs. 23 and 24) which are provided with indentations or ledges 192 for engaging a bottom surface or guide track 194 of the upper plate of upper assembly 186 adjacent slot 190.

It is to be noted that legs 190 are also spaced apart to define a retaining means such as an opening 196 for receiving and holding a lug 198 provided on the end of lever 182. To facilitate orientation of the lever in a selected extended or retracted position, a detent means such as projection 200 is dimensioned to engage either one of a pair of positioning recesses or notches 202 and 204. Slide element 182 and its cooperation with lever 182 may be thought of as an actuation means rectilinearly shiftable in either a forward or rearward direction, relative to the length of a water board, for selectively orienting a fin in a predetermined position. Slot 190 defines a throw of slide element 184 and therefore provides an accurate guide so that a boarder can quickly and effortlessly adjust the position of fin 180. Legs 190 serve a dual purpose, i.e., to transmit force from slide element 184 to fin 180 via lever 182 and to also orient the slide element for positioning along slot 190 by means of guide tracks 194.

While the subject of the present invention has been described with reference to the foregoing preferred embodiments, it will be apparent that other changes and modifications could be made by one skilled in the art without varying from the scope and spirit of the appended claims.

IT IS CLAIMED AND DESIRED TO SECURE BY LETTERS PATENT:

1. A retractable fin for a water board, said fin comprising:

a generally planar fin body;

a lever member joined to said body;

a casing having top and bottom surfaces with slots formed therein, said casing receiving said fin body and lever member with the lever member extending through the slot of the top surface and fin body disposed for selective extension through the slot of the bottom surface, said casing having a depth substantially equal to that of the board whereby it may extend through the depth of the board without extending appreciably to either side thereof, said fin body and casing being so proportioned relative to one another that said body may be completely contained within said casing;

pivot means joining said fin to said casing for movement between a first position completely contained within the casing and a second position extending from said bottom surface; and

detent means to selectively secure to fin body relative to the casing in said first and second positions.

2. The retractable fin according to claim 1 wherein said detent means comprises a protrusion on the lever which is selectively engageable with complementary sockets therefor in the casing.

3. The retractable fin according to claim 2 wherein said complementary sockets comprise notches formed in the casing.

4. The retractable fin according to claim 2 wherein the lever is resiliently deflectable to permit the protrusion to be selectively engaged with and disengaged from said sockets.

5. The retractable fin according to claim 4 further comprising cooperable cam means on said protrusion and at least one of said sockets to deflect said lever and permit the cam body to move from the second position to the first position in response to the application of external force to the fin body while in the second position.

6. The retractable fin according to claim 1 wherein a handle is secured on a portion of the lever extending through the slot of the top surface to enable the lever to be used to manually move the fin body between the first an second positions.

7. A retractable fin assembly for mounting within a water board having top and bottom surfaces and a given depth, said assembly comprising:

a casing having a depth equal to or less than that of the board, said casing having a top and bottom and defining a cavity opening through the bottom;

first and second flanges secured to the top and bottom of said casing for engagement with the top and bottom of the board, at least one of said flanges being removable from the casing to permit the casing to be extended through an opening therefor extending through the board;

means to selectively secure the flanges to the top and bottom surfaces of a board through which the casing is extended;

a fin body received within the cavity, said body being so proportioned relative to the casing that it may be fully contained therein;

means mounting the fin body within the casing for select movement between a first position fully contained within the casing and a second position extending from the open bottom of the casing; and

detent means to selectively lock the fin body in said respective first and second positions.

8. The fin assembly according to claim 7 further comprising a lever means secured to said fin body to manually move said body between said first and second positions.

9. The fin assembly according to claim 8 wherein the top of said casing is open and said lever means is accessible therethrough.

10. The fin assembly according to claim 7 wherein said detent means is releasable to permit the fin body to be moved from the first position to the second position responsive to the application of external force to the fin body.

11. A retractable fin assembly for mounting within a water board having top and bottom surfaces in a given depth comprising:

a casing having a depth equal to or less than that of the board, the casing also having a top and bottom and defining a cavity opening through the bottom of the board;

resilient release lever means mounted on the casing; and

a fin body received within the cavity and pivotally mounted therewithin including means operable for cooperating with the lever means so that the fin body may be held in a retracted position, the release lever being movable to permit the fin body to move to an extended position from the open bottom of the casing.

12. The fin assembly according to claim 11 wherein the release lever includes an extension from the casing for engaging a notch provided on the fin body when the fin is in the retracted position to thereby maintain the fin body in that position.

13. A retractable fin assembly for mounting within a water board having top and bottom surfaces and a given depth comprising:

a casing having a depth equal to or less than that of the board, the casing having a top and bottom and defining a cavity opening through the bottom; and

a fin body for mounting within the casing including means for permitting the fin to be rotated approximately 180 degrees from its extended position for mounting substantially entirely within the casing in a retracted position.

14. The fin assembly according to claim 13 wherein the casing includes socket means and wherein the fin includes ball means for mounting within the socket means when the fin is in both the extended and retracted positions.

15. The fin assembly according to claim 15 wherein the casing is provided with a retaining/release means operable for engaging and cooperating with a catch means provided on the fin.

16. The fin assembly according to claim 16 wherein the casing is provided with an access aperture for enabling passage therethrough of the ball means so that the fin may be removed from the casing.

17. A retractable fin assembly for mounting within a water board having top and bottom surfaces and a given depth comprising:

a casing having a depth equal to or less than that of the board, the casing having a top and bottom and defining a cavity opening through the bottom;

fin means mounted for pivotal movement between extended and retracted positions in the casing; and

extendable/retractable means mounted on the casing including rotatable means operable for engaging the fin means and selectively positioning it to extended or retracted positions.

18. The fin assembly according to claim 18 wherein the extendable/retractable means further includes nut means mounted on the fin, and wherein the rotatable means includes threaded means for cooperating with the nut means to effect relative movement between the casing and the fin.

19. A retractable fin assembly for mounting within a water board having top and bottom surfaces and a given depth comprising:

mounting means provided on the bottom of the board for supporting a fin and maintaining it in an extended position, the mounting means including means for permitting rotation of the fin about an axis parallel to the longitudinal axis of the board; and

recess means provided in the board for receiving the fin in a substantially retracted position after the fin has been rotated approximately 90 degrees.

20. The fin assembly according to claim 20 wherein rod means is provided on the upper edge of the fin for rectilinear shifting, relative to the longitudinal axis of the board, to permit rotation of the fin from its extended to retracted positions.

21. The fin assembly according to claim 21 wherein the rod means is provided with apertures for receiving pin means from the mounting means.

22. A retractable fin assembly for mounting within a water board having top and bottom surfaces in a given depth comprising:

a casing having a depth equal to or less than that of the board, the casing having a top and bottom and defining a cavity opening through the bottom;

a fin received within the cavity, so dimensioned relative to the casing that it may be fully contained therein; and

elongate means connected to the fin operable for extending and retracting the fin when a pushing or pulling force is exerted along the longitudinal axis of the elongate element.

23. The fin assembly according to claim 23 wherein the elongate means includes an end positioned remote from the casing means for engagement by a boarder.

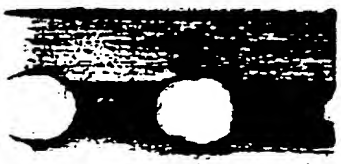
24. A retractable fin assembly for mounting within a water board having top and bottom surfaces and a given depth comprising:

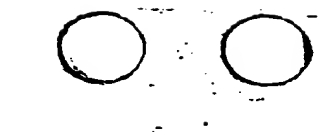
a casing having a depth equal to or less than that of the board, the casing having a top and bottom and defining a cavity opening through the bottom;

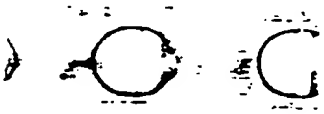
a fin received within the cavity, dimensioned relative to the casing so that it may be fully contained therein; and

actuating means mounted on the casing and connected to the fin operable for rectilinear shifting to a forward position whereby the fin is fully retracted within the casing and a rearward position whereby the fin is fully extended.

25. The fin assembly according to claim 24 wherein the actuating means is defined by a slide element having legs extending through the top of the casing for engagement with a lever provided on the fin.







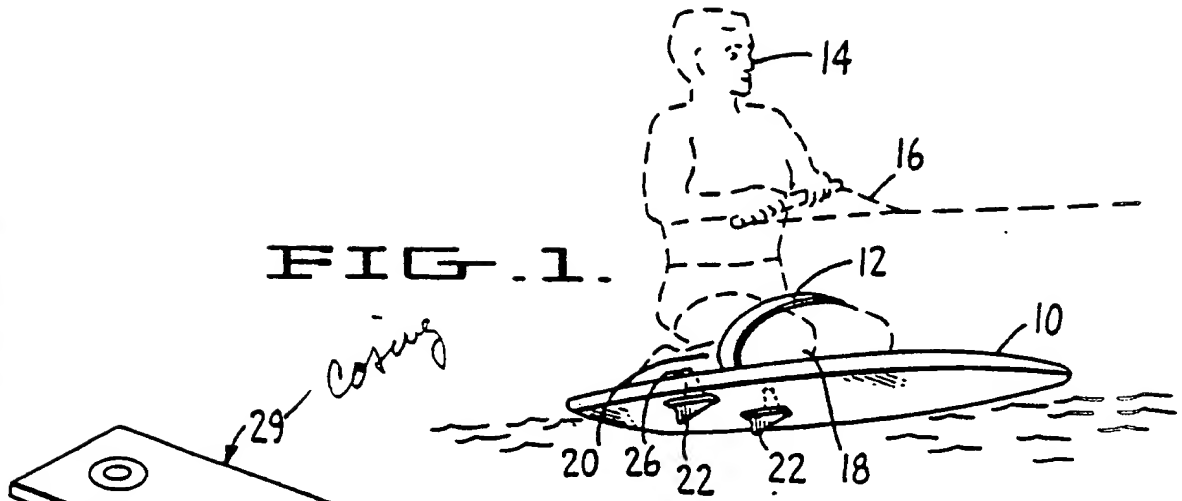


FIG. 1.

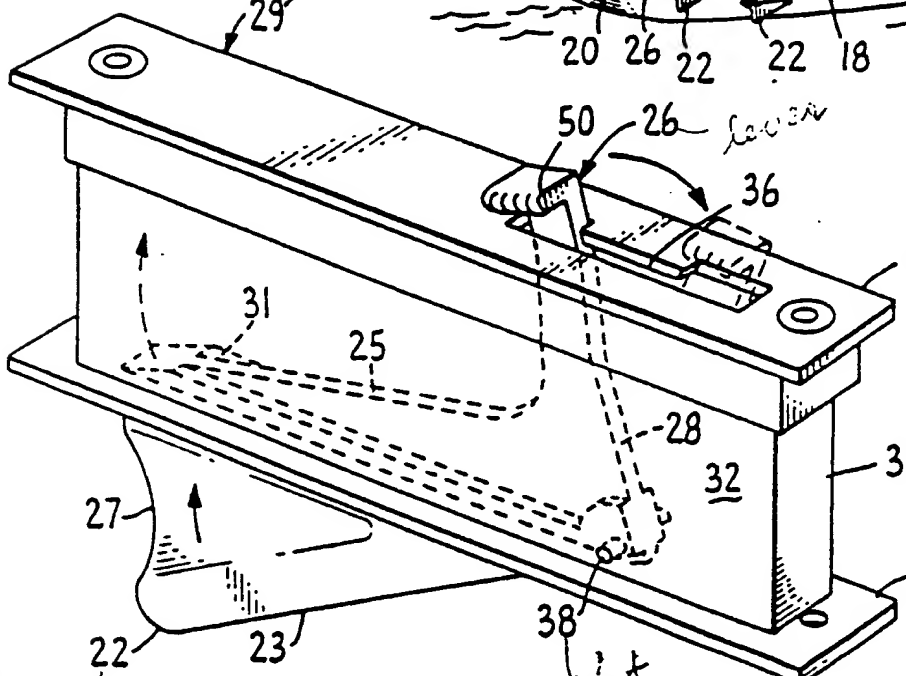


FIG. 2.

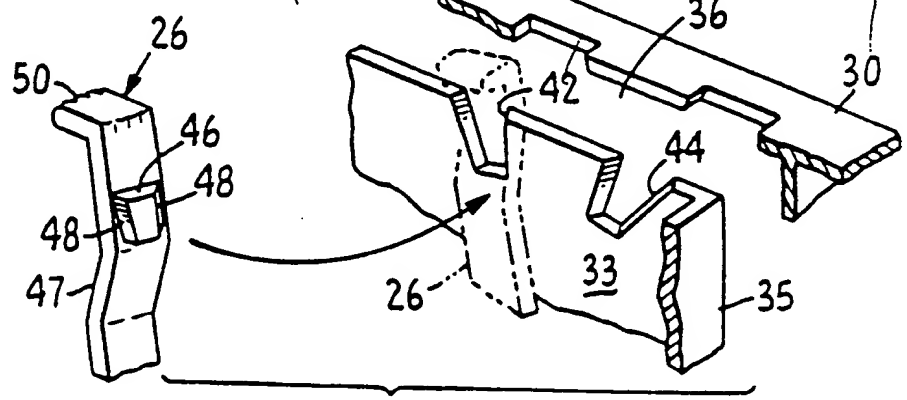
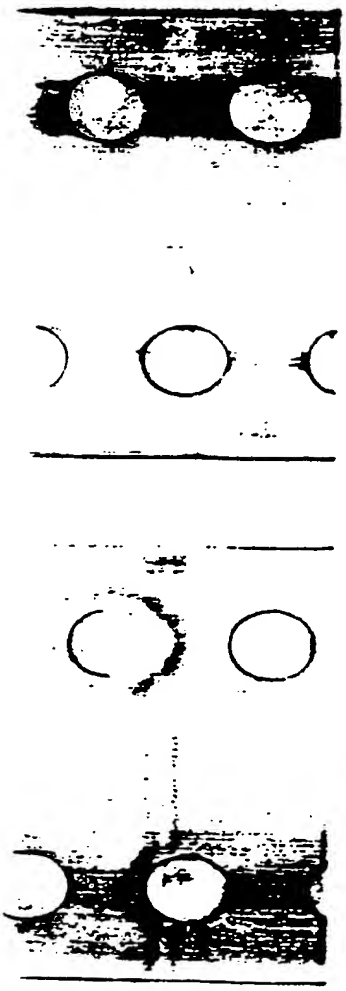


FIG. 3.



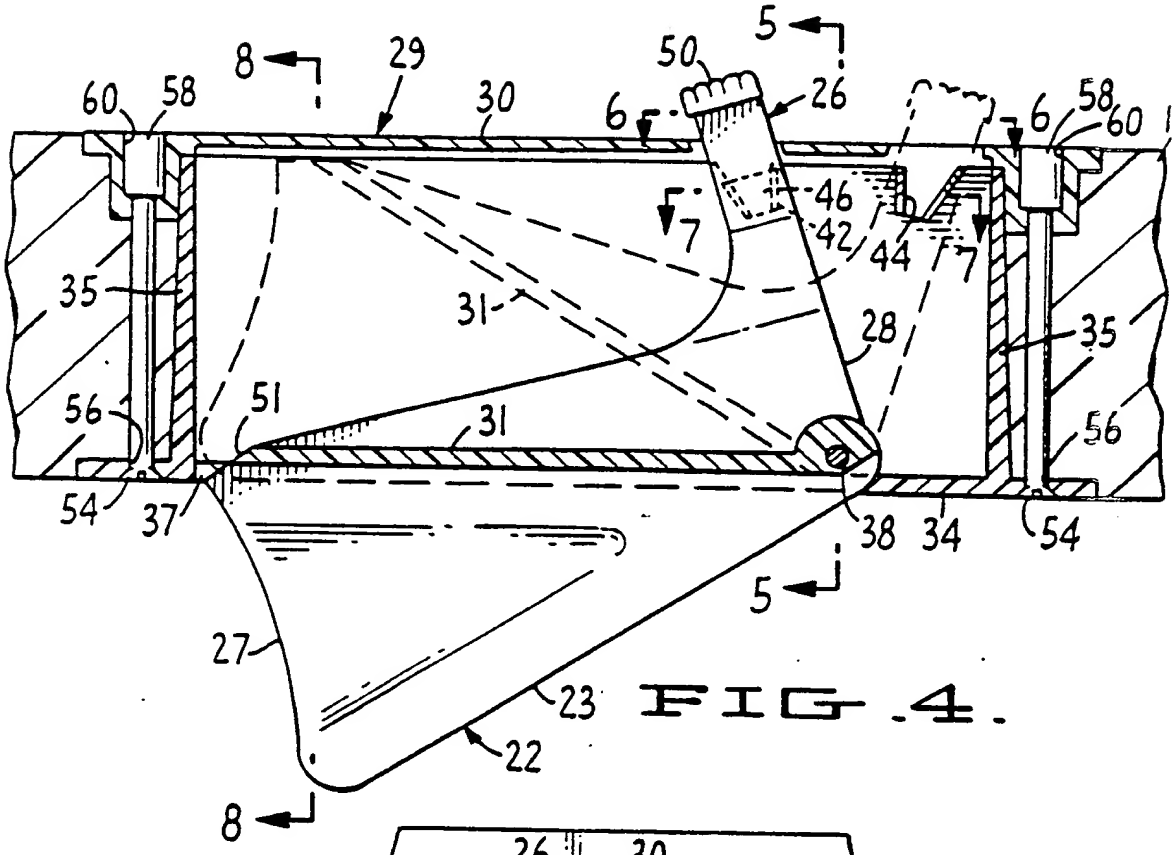


FIG. 4.

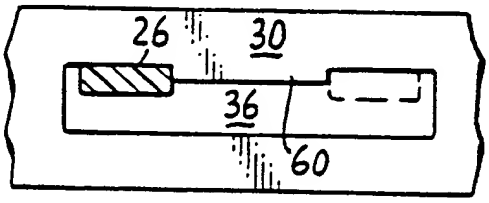


FIG. 6.

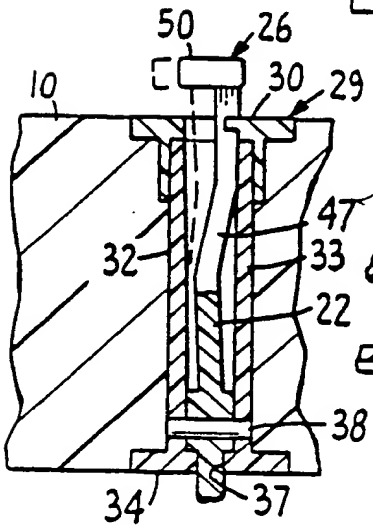


FIG. 5.

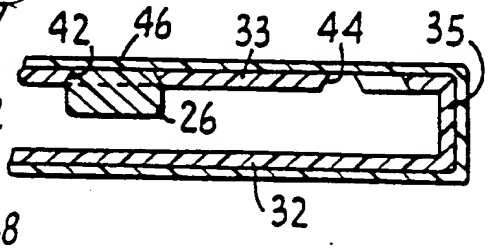


FIG. 7.

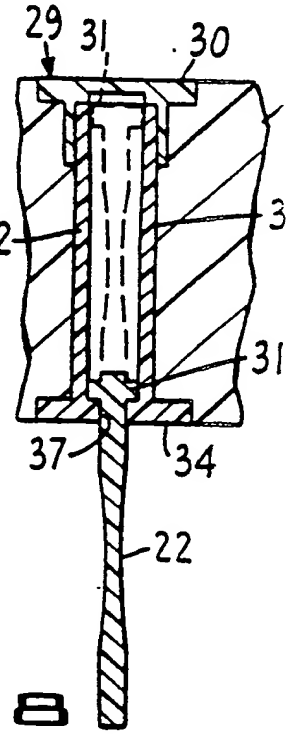


FIG. 8

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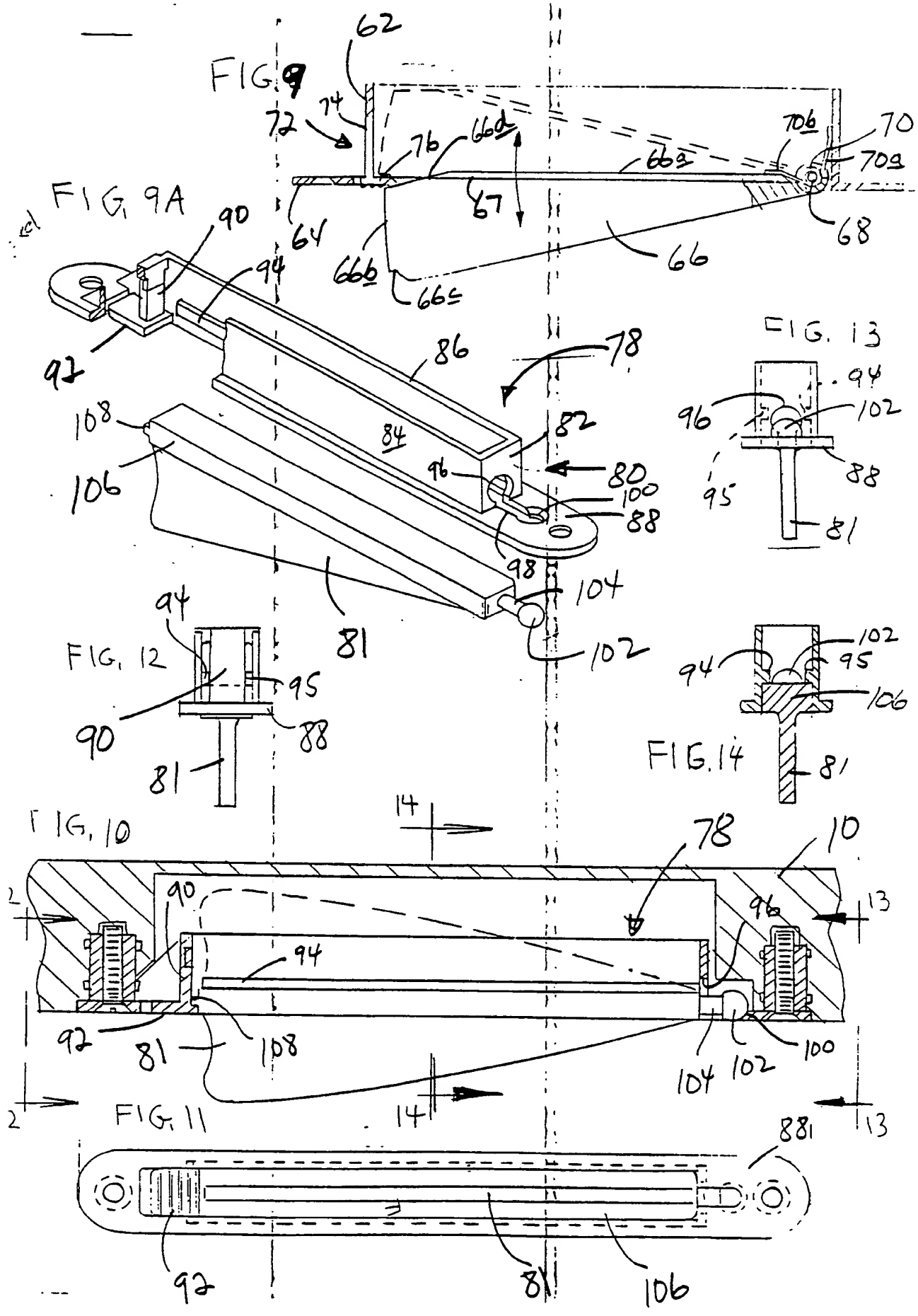
BAD ORIGINAL



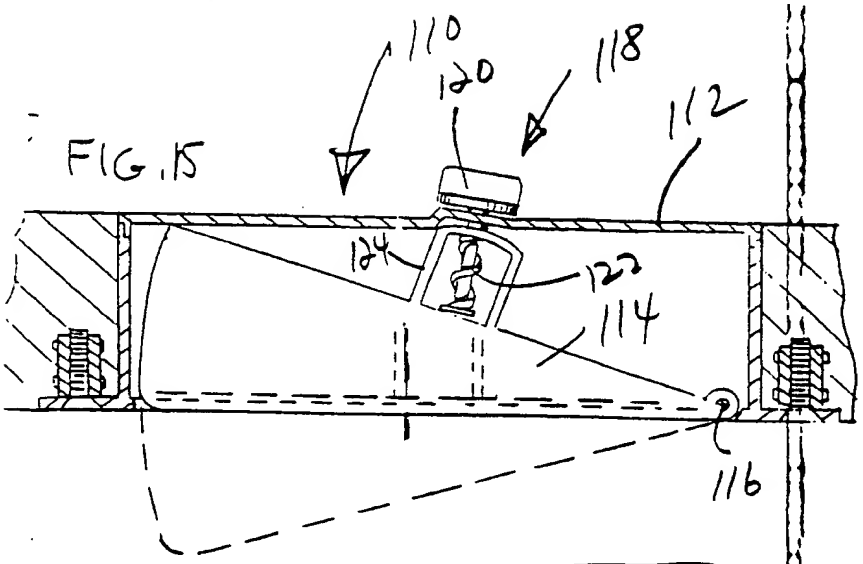


FIG. 15

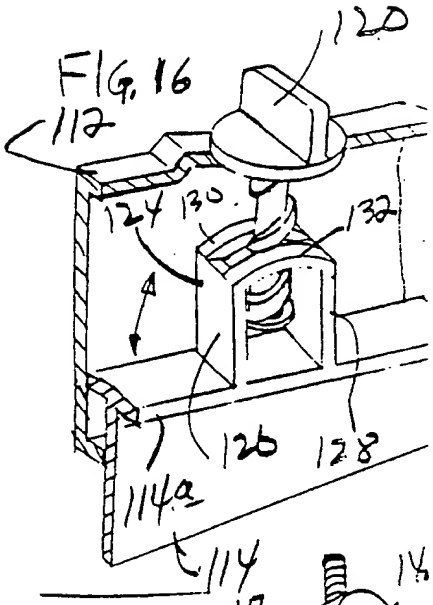


FIG. 16

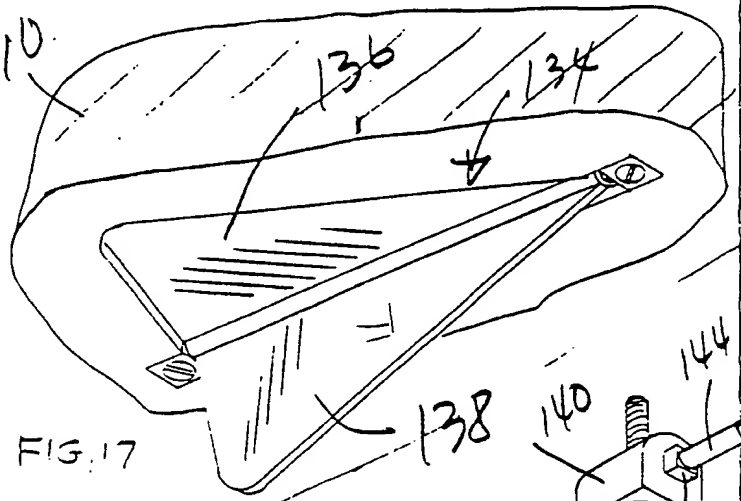


FIG. 17

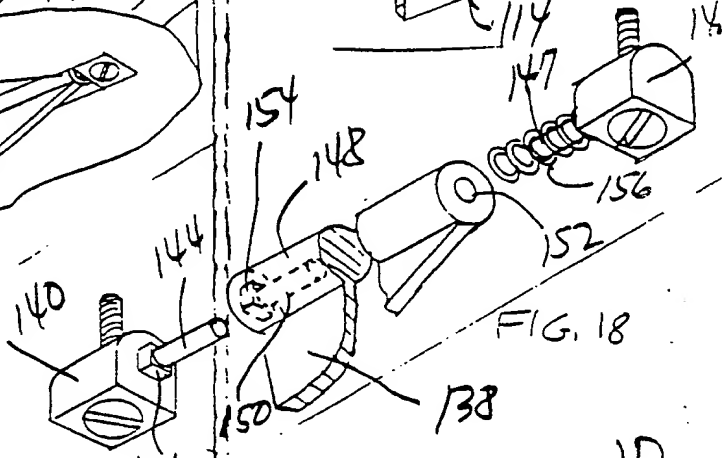


FIG. 18

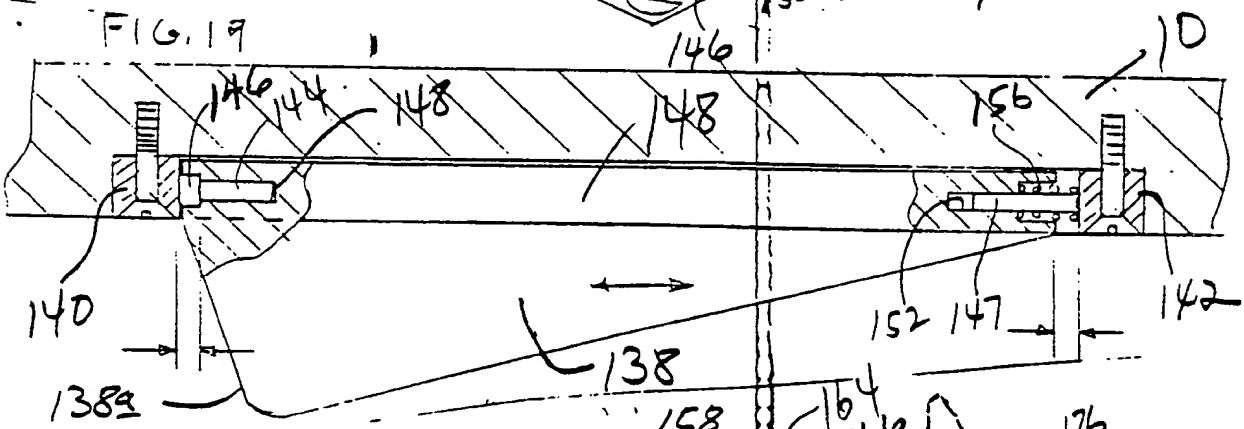


FIG. 19

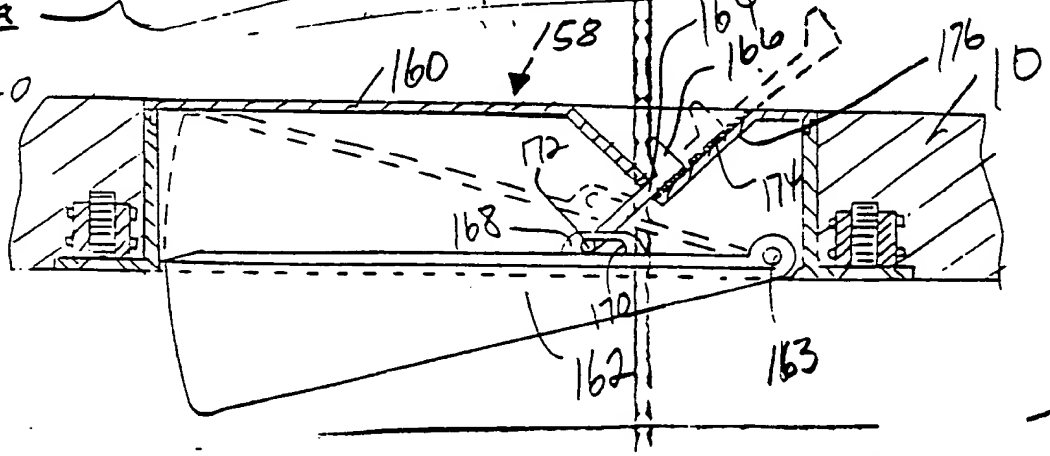


FIG. 20

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FIG. 21

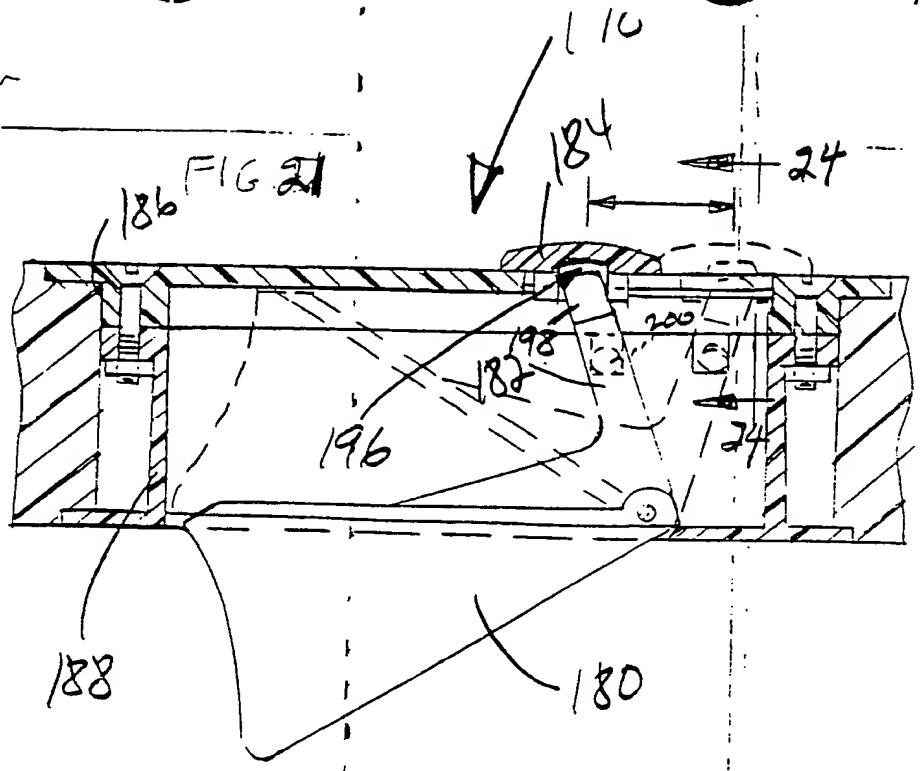


FIG. 24

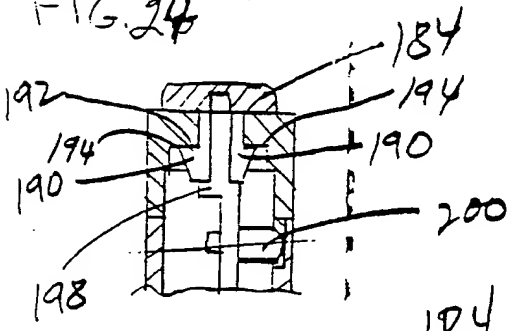


FIG. 23

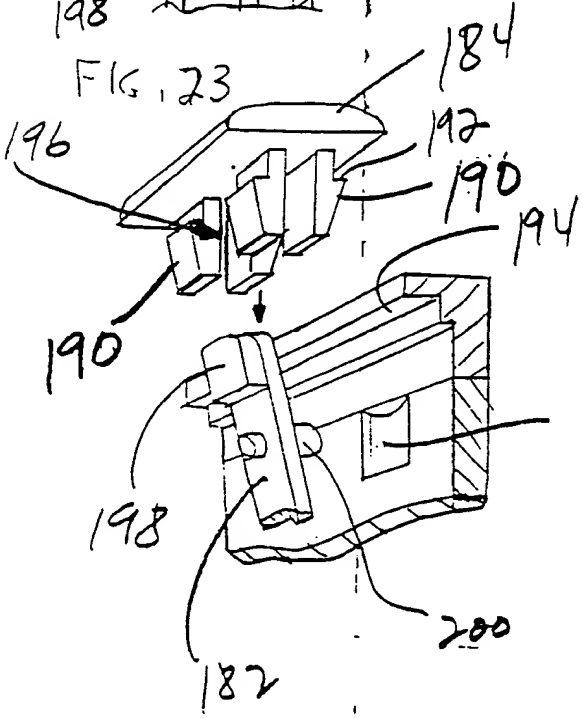
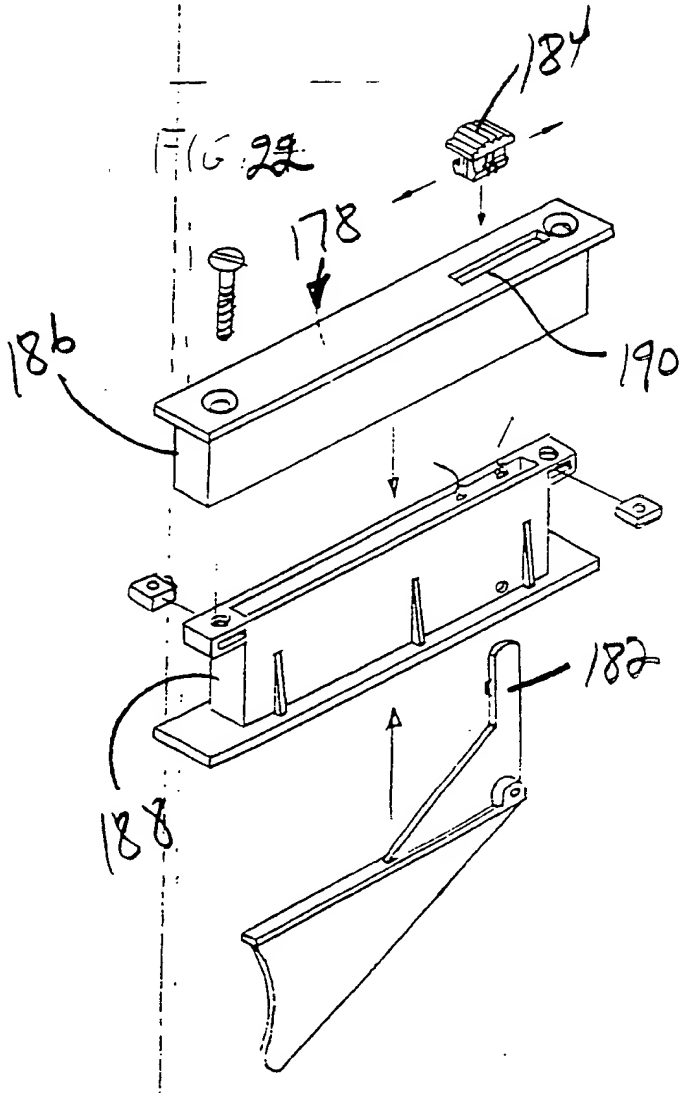


FIG. 22



INTERNATIONAL SEARCH REPORT

International Application No PCT/US87/00237

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL. [4] B63B 41/00
U.S. CL. 114/132

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	114/127-142, 39.2,143 280/43.17 441/65, 74, 79 74/475, 525,535

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	US, A, 3,902,441, (Soholle) 02 September 1975	11, 12, 22, 23,24, 25
X/Y	DE, A, 2,738,070, (Rehm) 01 March 1979	1-6 / 7-10
Y	JP. A, 55-72889, (Kabaya)	7-10, 17-19
Y	DE, A, 2,114,570, (Mares) 30 March 1972	17, 18
Y	US, A, 2,553,372, (Hurst) 15 May 1951	19
A	US, A, 3,087,173, (Meyer) 30 April 1963	1-25

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
7 April 1987	24 APR 1987
International Searching Authority [1]	**Signature of Authorized Officer** [20]
ISA/US	Paul E. Salmon Paul E. Salmon

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No [18]
A	US, A, 3,287,991, (Eckert) 29 November 1966	1-25
A	US, A, 4,493,665, (Liddle) 15 January 1985	1-25
A	GB, A, 878,936, (Readman) 4 October 1961	1-25
A	GB, A, 2,010,189, (Marker) 27 June 1979	1-25
A	DE, A, 3,446,844, (Ikonen) 11 July 1985	1-25
A	DE, A, 3,410,605, (Brookhaus) 03 October 1985	1-25